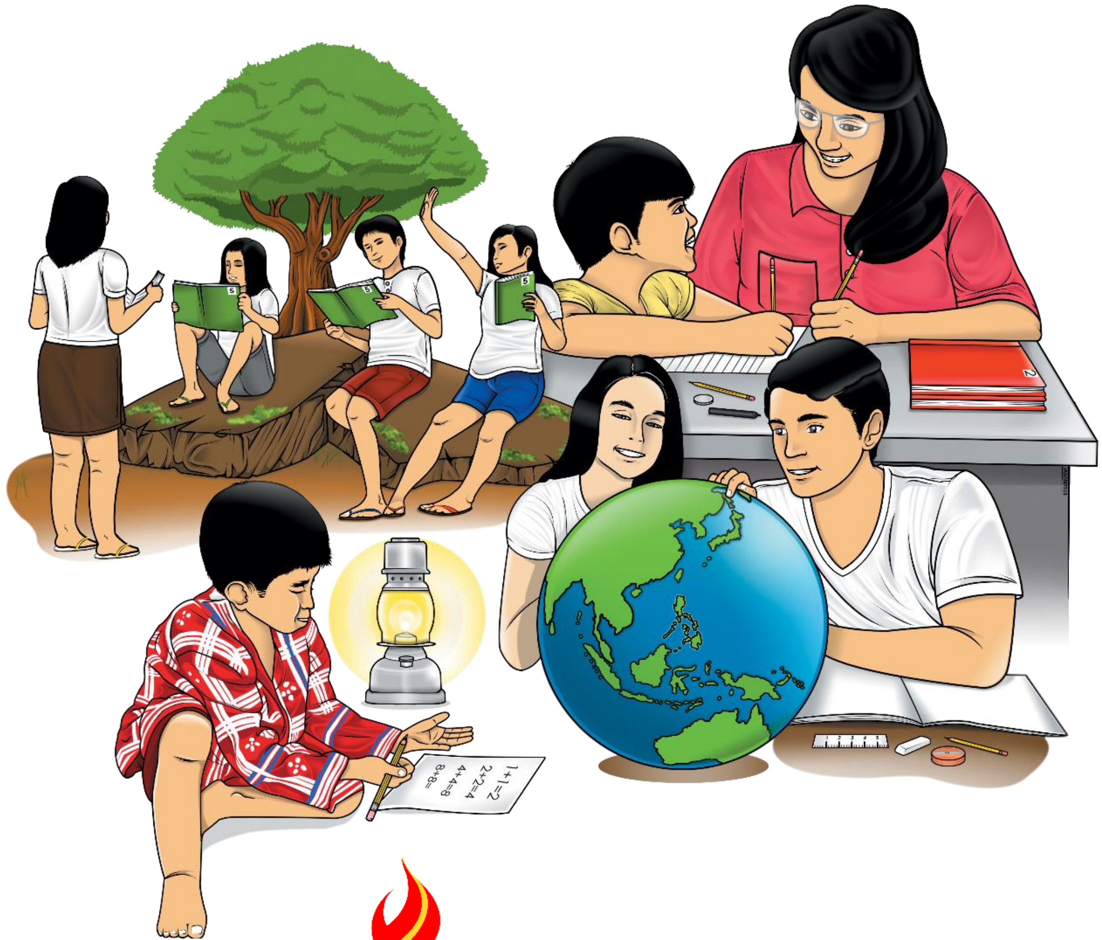
8

Mathematics

Quarter 1 – Module 3
Illustrating Rational Algebraic Expressions



Mathematics – Grade 8
Alternative Delivery Mode
Quarter 1 – Module 3 Illustrating Rational Algebraic Expressions
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8

Mathematics

Quarter 1 – Module 3
Illustrating Rational Algebraic Expressions

DEPARTMENT OF EDUCATION

Introductory Message

For the facilitator:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Illustrating Rational Algebraic Expressions!

This module was collaboratively designed, developed and reviewed by educators both from public and private institutions to assist you, the teacher or facilitator in helping the learners meet the standards set by the K to 12 Curriculum while overcoming their personal, social, and economic constraints in schooling.

This learning resource hopes to engage the learners into guided and independent learning activities at their own pace and time. Furthermore, this also aims to help learners acquire the needed 21st century skills while taking into consideration their needs and circumstances.

As a facilitator, you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning. Furthermore, you are expected to encourage and assist the learners as they do the tasks included in the module.

For the learner:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Illustrating Rational Algebraic Expressions!

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace and time. You will be enabled to process the contents of the learning resource while being an active learner.

This module has the following parts and corresponding icons:

What I Need to Know	This will give you an idea of the skills or competencies you are expected to learn in the module.
What I Know	This part includes an activity that aims to check what you already know about the lesson to take. If you get all the answers correct (100%), you may decide to skip this module.
What's In	This is a brief drill or review to help you link the current lesson with the previous one.
What's New	In this portion, the new lesson will be introduced to you in various ways; a story, a song, a poem, a problem opener, an activity or a situation.
What is It	This section provides a brief discussion of the lesson. This aims to help you discover and understand new concepts and skills.
What's More	This comprises activities for independent practice to solidify your understanding and skills of the topic. You may check the answers to the exercises using the Answer Key at the end of the module.
What I Have Learned	This includes questions or blank sentence/paragraph to be filled in to process what you learned from the lesson.
What I Can Do	This section provides an activity which will help you transfer your new knowledge or skill into real life situations or concerns.
Assessment	This is a task which aims to evaluate your level of mastery in achieving the learning competency.
Additional Activities	In this portion, another activity will be given to you to enrich your knowledge or skill of the lesson learned.
Answer Key	This contains answers to all activities in the module.

At the end of this module you will also find:

References	This is a list of all sources used in developing this module.

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer *What I Know* before moving on to the other activities included in the module.
3. Read the instruction carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your teacher/facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator. Always bear in mind that you are not alone.

We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!

What I Need to Know

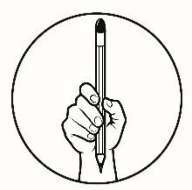
This module was designed and written for you to answer the activity you've missed while you are away from school. This module will help you define, identify, illustrate rational algebraic expressions, and relate its concepts in real-life situation. The scope of this module can be used in many different learning situations. Throughout this module, you will be provided with varied activities to process your knowledge and skills acquired, deepen and transfer your understanding of the rational algebraic expressions. Activities are arranged accordingly to correspond with your learning needs.

This module contains:

Lesson 1: Illustrating Rational Algebraic Expressions

After going through this module, you are expected to:

1. define rational algebraic expressions;
2. identify rational algebraic expressions;
3. evaluate rational algebraic expressions; and
4. relate rational algebraic expressions in real-life situation.



What I Know

Choose the letter of the correct answer. Write your answer on a separate sheet.

1. What do you call an expression in fraction form in which the numerator and the denominator are polynomials?

   A. rational algebraic equation
   B. linear algebraic expression
   C. rational algebraic expression
   D. linear algebraic equation

2. In a rational algebraic expression written in the form of $\frac{P}{Q}$, where P and Q are polynomials, the polynomial Q must not be equal to ____.

   A. 0
   B. 1
   C. 2
   D. 3

3. Which of the following is a rational algebraic expression?

   A. $\frac{6}{x-1}$
   B. $\frac{2-\sqrt{x}}{4-x}$
   C. $\frac{4+\frac{3}{x}}{y-2}$
   D. $\frac{1-x}{1+\frac{1}{x}}$

4. What value of x will make the rational algebraic expression $\frac{5x+3}{x-6}$ undefined?

   A. -6
   B. $-\frac{3}{5}$
   C. 6
   D. $\frac{3}{5}$

5. What is the value of the rational expression $\frac{2x+1}{x}$ when $x = 1$?

   A. 2
   B. 3
   C. 4
   D. 5

6. What is the value of the expression $\frac{x^2+5x}{x^2+1}$ when $x = -1$?

   A. -2
   B. -1
   C. 0
   D. 1

7. Which of the following represents a ratio of two polynomials?

A. $(x+1)+(x-3)$
B. $(x+1)-(x-3)$
C. $(x+1)(x-3)$
D. $\frac{(x+1)}{(x-3)}$

8. Which of the following is a rational algebraic expression with a monomial in the numerator and a binomial in the denominator?

A. $\frac{d}{t}$
B. $\frac{x+1}{y}$
C. $\frac{x}{6x-5}$
D. $\frac{3x-9}{x-3}$

9. A speedy biker can travel 5 km per t hours. Which of the following expressions best illustrates the situation?

A. $5t$
B. $5t^{\frac{1}{2}}$
C. $\frac{t}{5}$
D. $\frac{5}{t}$

10. Vince can complete his school activity in x hours. What part of the activity can be completed by Vince after 4 hours?

A. $4x$
B. $\frac{4}{x}$
C. $x-4$
D. $x+4$

11. What is the value of x that will make the expression $\frac{x^4+2x+1}{x^2+2x+1}$ undefined?

A. -1
B. 0
C. 1
D. 2

12. Which of the following represents the phrase "The ratio of twice the sum of x and y to the difference of x and twice y"?

A. $\frac{2x+y}{x-2y}$
B. $\frac{2(x+y)}{x-2y}$
C. $\frac{2x+y}{2(x-y)}$
D. $\frac{2x+2y}{2x-2y}$

13. Which of the following satisfies the phrase "The sum of five and one third of a number n divided by the sum of twice a number y and 3"?

A. $\frac{5+\frac{1}{3}n}{2y+3}$
B. $\frac{5+\frac{1}{3}n\div 2y}{3}$
C. $\frac{5\frac{1}{3}+n}{2(y+3)}$
D. $\frac{(5+\frac{1}{3}n)\div 2y}{3}$

14. If Jed can accomplish the school activity in five hours while Vince can accomplish the same activity in x hours, which expressions below represents the rate of Jed and Vince working together?

A. $5 + x$

B. $x - 5$

C. $\frac{1}{5} - \frac{1}{x}$

D. $\frac{1}{5} + \frac{1}{x}$

15. The formula for finding the circumference of a circle is $C = 2\pi r$, where C is the circumference and r is the radius of the circle. What is the formula in finding the radius of the circle given its circumference?

A. $\frac{C}{\pi}$

B. $\frac{C}{2\pi}$

C. $\frac{2C}{\pi}$

D. $\frac{C\pi}{2}$

Lesson 1 Illustrating Rational Algebraic Expressions

The speed of a running motorcycle can be computed by the ratio of its distance travelled and the elapsed time. How can you write this into a mathematical expression?

In your previous grade level, recall that ratio shows the comparative sizes of two or more values such as 1:4, which can also be written in fraction form $\frac{1}{4}$. Other examples of ratio in fraction form are $1/8$, $\frac{1}{3}$, $\frac{a}{b}$ or $\frac{x}{y}$.

Let us start this lesson by reviewing the concepts in translating verbal phrases to mathematical expressions and identifying polynomials which you had learned in your Mathematics 7.

Enjoy learning!

What's In

A. MATCH IT TO ME

Match the verbal phrases in column (A) to the corresponding mathematical phrases in column (B). Write the letter of your answer to the separate sheet of paper.

A. Verbal Phrase	B. Mathematical Phrase
1. The sum of a number n and nine	A. $\sqrt[3]{n} - 5$
2. The product of n and the number eight	B. $n - 21$
3. The ratio of distance (d) and time (t)	C. $n + 9$
4. The difference of a number n and twenty-one	D. $\frac{d}{t}$
5. The cube root of a number n decreased by five	E. $\sqrt{n} + 21$
	F. $8n$

Questions:

1. What must be considered in translating verbal phrases to mathematical phrases?
2. Will you consider these mathematical phrases as polynomials? Why or why not?
3. How will you describe a polynomial?

B. IDENTIFYING POLYNOMIALS

Identify whether the expression is a polynomial or not? Write **P** if it is polynomial and **NP** if it is not. Write your answer on a separate sheet of paper.

1. $x + 3$
2. x^{-4}
3. $2d$
4. $3c^2 + 2c$
5. $3d^{-2} + 1$
6. $\sqrt{x} + 2$

Questions:

1. Were you able to identify each expression?
2. How did you classify a polynomial from not a polynomial?
3. What difficulty did you encounter in determining polynomials?
4. What expression can be formed when you write two expressions from the activity in fraction form?

What's New

ACTIVITY: PAIR APPEAR

Below are the list of expressions grouped into columns. Pair expressions in column A and column B to illustrate a ratio of two expressions. The answer of the first item is provided.

	Column A	Column B	$\frac{\boldsymbol{Column\ A}}{\boldsymbol{Column\ B}}$
1	6	$x-3$	$\frac{6}{x-3}$
2	y^2-1	y^3-3	
3	$18n+1$	n^2+n-2	
4	$3x-\sqrt{y}$	$5\sqrt{x}$	
5	$2x^{-2}-3$	$x+6$	
6	$3-z^3$	$z^{-2}+5$	

Questions:

1. What expressions are formed in items 1, 2, and 3? Are these expressions in fraction form?
2. What have you noticed in the numerator and denominator of the expressions formed in items 1, 2 and 3? Are the numerators and denominators of these expressions polynomials?
3. What have you noticed in the numerator and denominator of the expressions formed in items 4, 5 and 6? Are the numerators and denominators of these expressions polynomials?
4. What have you noticed in the terms of the numerator and denominator of items 4, 5, and 6? What are their exponents?

What is It

A **rational algebraic expression** is an expression that can be written in the form $\frac{P}{Q}$ where $\boldsymbol{P}$ and $\boldsymbol{Q}$ are polynomials and $\boldsymbol{Q}$ must not be equal to 0 ($Q \neq 0$). In other words, a rational algebraic expression is an expression whose numerator and denominator are polynomials. From the previous activity, expressions formed in items 1,2 and 3 are rational algebraic expressions because the numerator and the denominator are both polynomials. On the other hand, expressions formed in items 4, 5, and 6 are not rational algebraic expressions because the numerator and denominator of the expressions are not polynomials.

How will you know that the expression is a rational algebraic expression? For you to recognize rational algebraic expressions, examine the following examples.

Presentation 1:

Check these expressions.

$$\frac{6}{x-3} \qquad \frac{y^2-1}{y^3-3} \qquad \frac{18n+1}{n^2+n-2} \qquad \frac{5x^2+6x-11}{1}$$

All of the expressions here are rational algebraic expressions since these contain polynomial expressions in both numerator and denominator, respectively.

Presentation 2:

Check these expressions:

$$\frac{3x-\sqrt{y}}{5\sqrt{x}} \qquad \frac{3x-\sqrt{y}}{x+6} \qquad \frac{2x^{-2}-3}{x+6} \qquad \frac{2x^{-2}-3}{5\sqrt{x}} \qquad \frac{3+\frac{1}{2-x}}{z^{-2}+5}$$

All of the expressions here are not rational algebraic expressions since the expressions contain irrational numbers ($\sqrt{x}$ and $\sqrt{y}$) and variables having negative exponents (x^{-2} and z^{-3}), which are not polynomials.

Here's a useful checklist in identifying whether the expression is a rational algebraic expression:

- ✓ The expression must be in fraction form.
- ✓ The expression must have in its numerator and denominator a constant, a variable, or a combination of both, that are polynomial expressions.
- ✓ The expression must not have a negative exponent, a radical sign or a fraction exponent in the variable/s in both numerator and denominator.

Recall that the rational algebraic expression is a fraction containing polynomials in both numerator and denominator, provided that the denominator **must not be equal to zero**. The denominator cannot be zero because a division of 0 is **undefined or meaningless**. In rational algebraic expressions, you need to pay attention to what values of the variables that will make the denominator equal to 0. These values are called **excluded values**. How are you going to determine the excluded value/s in a rational algebraic expression?

Steps in Determining the Excluded Values:

(Study Tip: Just pay attention to the denominator of the expression to determine the excluded values.)

Step 1: Let the expression in the denominator be equal to 0.

Step 2: Solve the equation to determine the value/s of the variable.

Below are the illustrative examples that will help you understand it better.

Illustrative Example 1:

Identify the value of x that will make $\frac{6}{x-3}$ undefined.

Solution:

Step 1: Let the expression in the denominator be equal to 0.

$$x - 3 = 0$$

Step 2: Solve the equation to determine the value/s of the variable.

$x - 3 = 0$	(Given)
$x - 3 + 3 = 0 + 3$	(Add both sides by 3 by Addition Property of Equality)
$x + 0 = 3$	(by simplifying)
$\boldsymbol{x = 3}$	

This means that when $x = 3$, the expression $\frac{6}{x-3}$ is undefined. Thus, $x = 3$ is an excluded value in the given rational algebraic expression, or in other words, x cannot be 3. What happens if you substitute 3 to the expression?

$$\frac{6}{x-3} = \frac{6}{3-3} = \mathbf{\frac{6}{0}}$$

Since division of any number by 0 is undefined, therefore 3 is an excluded value for this rational algebraic expression.

Illustrative Example 2:

Identify the value/s of n that will make $\frac{18n+1}{n^2+n-2}$ undefined.

Solution:

Step 1: Let the expression in the denominator be equal to 0.

$$n^2 + n - 2 = 0$$

Step 2: Solve the equation to determine the value/s of the variable.

$n^2 + n - 2 = 0$		(Given)
$(n+2)(n-1) = 0$		(by factoring $\mathrm{n}^2 + \mathrm{n} - 2 = 0$)
$n + 2 = 0$	$n - 1 = 0$	(by Zero Product Property)
$n + 2 + (-2) = 0 + (-2)$	$n - 1 + 1 = 0 + 1$	(by Addition Property of Equality)
$n = -2$	$n = 1$	(by Simplifying)

This means that n cannot be -2 nor 1. What happens if you substitute that values to the expression?

If $n = -2$:

$$\frac{18n+1}{n^2+n-2} = \frac{18(-2)+1}{(-2)^2+(-2)-2} = \frac{-36+1}{4-2-2} = \mathbf{\frac{-35}{0}}$$

If $n = 1$:

$$\frac{18n+1}{n^2+n-2} = \frac{18(1)+1}{(1)^2+(1)-2} = \frac{18+1}{1+1-2} = \mathbf{\frac{19}{0}}$$

Since division of any number by 0 is undefined, therefore -2 and 1 are excluded values for this rational algebraic expression.

You can verify that if the excluded value/s is substituted in the expression, it always ends up to division by 0. You have to bear in your mind that there are some values that will make the expression defined, too. How are you going to inspect it? The process is called evaluating the expression.

Illustrative Example 1:

Evaluate the expression $\frac{y^2-1}{y^3-3}$ when $y = 2$.

Solution:

Step 1: Replace the variable y with the given value.

$$\frac{y^2-1}{y^3-3} = \frac{(2)^2-1}{(2)^3-3} \quad \text{(by substituting } y = 2\text{)}$$

Step 2: Simplify the numerator and the denominator.

$$\frac{(2)^2-1}{(2)^3-3} = \frac{4-1}{8-3}$$
$$= \mathbf{\frac{3}{5}}$$

Thus, when $y = 2$, the expression $\frac{y^2-1}{y^3-3}$ is equal to $\frac{3}{5}$.

Illustrative Example 2:

Evaluate the expression $\frac{5x^2+6x-11}{1}$ when $x = 2$.

Solution:

Step 1: Replace the variable x with the given value.

$$\frac{5x^2+6x-11}{1} = \frac{5(2)^2+6(2)-11}{1} \quad \text{(by substituting } x = 2\text{)}$$

Step 2: Simplify the numerator and the denominator.

$$\frac{5(2)^2+6(2)-11}{1} = \frac{5(4)+6(2)-11}{1}$$
$$= \frac{20+12-11}{1}$$
$$= \frac{21}{1}$$
$$= 21$$

Thus, when $x = 2$, the expression $\frac{5x^2+6x-11}{1}$ is equal to 21.

Try applying rational algebraic expression in real-life situation. Consider these illustrative examples:

Illustrative Example 1:

Vannessa can finish writing a module in x hours, while his brother Ryan can finish writing the same module in y hours. Write an expression that will illustrate their rate of work to finish writing the module.

This can be illustrated using a table:

	Time (in hours)	$\frac{\textbf{part of work}}{\textbf{hour}}$
Vannessa	x	$\frac{1}{x}$
Ryan	y	$\frac{1}{y}$

You can represent $\frac{1}{x}$ for Vannessa to accomplish a work per hour since she can finish writing one module alone in x hours. On the other hand, you can represent $\frac{1}{y}$ for Ryan to accomplish a work per hour since he can finish writing one module alone in y hours.

Illustrative Example 2:

The area of a rectangle is $(\mathrm{x}^2 - 121)$ square units while its width measures $(\mathrm{x} + 11)$ units. Illustrate a rational algebraic expression in finding the length of the rectangle.

Solution:

Recall that the formula in finding the length given the area and the width of the rectangle is

$$length = \frac{Area_{rectangle}}{width}$$

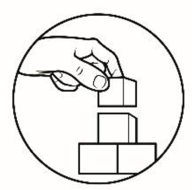
Substituting the area and the width of the rectangle,

$$length = \frac{Area_{rectangle}}{width} = \frac{x^2 - 121}{x + 11}$$

Then the length of the rectangle can be illustrated as

$$\frac{x^2 - 121}{x + 11}$$

There are many ways to illustrate real-life situations depending on what technique interests you most. You need to develop your understanding about illustrating rational algebraic expression through accomplishing the succeeding activities of this module.



What's More

Activity 1: You Belong with Me

Classify the different expressions below as to which set of expressions they belong. Write the expression in the appropriate column.

$$\frac{1-y}{y^7} \qquad \frac{\sqrt{7}x}{x-7} \qquad \frac{b^4}{\sqrt[7]{c^5}}$$

$$\frac{x-y^{\frac{2}{3}}}{7y-7} \qquad \frac{2x^2+5}{x^2-7x+3} \qquad \frac{2x+1}{3x^{-2}-7x+1}$$

Rational Algebraic Expressions	Not Rational Algebraic Expressions

Activity 2: "Excluded" Part of Me

Determine the excluded value/s that will make the given expression undefined.

1. $\frac{6x}{2x-4}$
2. $\frac{x^2+3x-5}{x^2-1}$
3. $\frac{x^3-4x^2+2x}{x^2-5x+6}$

Activity 3: Know My Value

Directions: Evaluate the rational algebraic expressions. Write your answer on your answer sheet.

____________1. $\frac{5x}{3x-9}$; $x = 4$

____________2. $\frac{y^2+4y+1}{y^2-1}$; $y = -2$

____________3. $\frac{z^3-4z^2+2z}{z^2-5z+6}$; $z = -3$

Activity 4: Represent Me

Represent the given phrases and statements into rational algebraic expression.

1. The sum of 3 and one third of a number n divided by the sum of thrice a number n and 7

2. Miggy can complete his school math reviewer in t hours. What part of the work can be completed by Miggy after 4 hours?

3. Patricia can cook *adobo* in x hours, while her brother Joseph can cook the same recipe in y hours. Write an expression that will illustrate their rate of work in cooking *adobo*.

What I have learned

Fill in the Blanks

Complete the paragraph below by filling in the blanks with correct word/s or figure/s which you can choose from the box below. Each word or figure may be used repeatedly. Write your answer on a separate sheet.

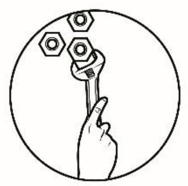
replacement	zero	polynomials	evaluating	variable
solve	negative	P/Q	undefined	division
factor	excluded	numerator	denominator	equal
simplify	substituted	fraction	fractional exponent	

A rational algebraic expression is an expression of the form ______, where P and Q are ____________________ and Q should not be equal to ____________.

You can identify a rational algebraic expression if it is in ____________ form, the _____________ and denominator are polynomials, and does not have a _____________exponent and a ___________________ in the variables in both numerator and denominator. The _________ of the rational algebraic expression cannot be zero because a division of 0 is _____________ or meaningless. You need to pay attention to what values of the variable that will make the denominator equal to 0. These values are called____________ values. To determine the said values, you need to let the expression in the denominator be ________ to 0. Then, _________ the equation to determine the value/s of the variable.

You can verify that if the excluded value/s is ____________ in the expression, it always ends up to the ____________ by 0. You have to bear in your mind that there are some values that will make the expression defined, too. The process is called ______________ the expression. The first step is to replace the variable with the given value. Second is to ___________ the numerator and the denominator.

Rational algebraic expressions can be useful tools for representing real life situations and for finding answers to real problems. This best describes the distance-speed-time questions, and modeling multi-person work problems.



What I can Do

The Pandemic Problem

Read the problem below and answer the questions that follow.

In the year 2020, a disease named Corona Virus Disease 2019 (COVID-19) put the world in fear, declaring it into a pandemic. With the exponentially increasing COVID-19 cases in the world until at present, Enhanced Community Quarantine (ECQ) was set to contain persons through staying at home and banning mass gatherings to avoid transmission of the disease. As such, "barter system" came to exist in the marketing system. Cona prepared for this crisis through planting succulents for bartering it with her needs. She noticed that her rate of planting is that each $2b + 4$ number of succulent is to be planted in $b - 1$ hours, where b is the number of persons who wanted to barter.

Questions:

1. What rational algebraic expression will best represent the situation?
2. What is Cona's rate of planting succulents if there are 3 persons who wanted to barter succulents? how about if there are 7 persons who wanted to barter succulents?

Assessment

Read each questions carefully. Choose the letter of the correct answer and write it on a separate sheet of paper.

1. Which of the following terms is described as "the ratio of two polynomial expressions"?
   A. linear algebraic expression C. rational algebraic expression
   B. linear algebraic equation D. rational algebraic equation

2. In a rational algebraic expression written in the form of $\frac{P}{Q}$, where P and Q are polynomials, the polynomial Q must not be equal to ________.
   A. -1 C. 1
   B. 0 D. 2

3. Which of the following is considered a rational algebraic expression?
   A. $\frac{3n}{\sqrt{n}}$ C. $\frac{2x^{-2}-7x}{n^2}$
   B. $\frac{3n+9}{n^3-2}$ D. $\frac{4x+11}{n^{-2}-1}$

4. Which of the following is an example of a rational algebraic expression?
   A. $\frac{3\,n^2}{15\sqrt[3]{n}}$ C. $\frac{5x^3+4}{2n+3}$
   B. $\frac{3n+\sqrt{n}}{2+\,3n}$ D. $\frac{3x^{-5}}{2n^{-2}+1}$

5. Evaluate the expression $\frac{2x+5}{3x}$ when $x = -1$.
   A. -1 C. 1
   B. 0 D. 2

6. What is the value of the expression $\frac{x^2-5x+12}{x^2-1}$ when $x = 2$?
   A. 1 C. 3
   B. 2 D. 4

7. Which of the following is a rational algebraic expression having trinomial on both numerator and denominator?
   A. $\frac{d-3}{d-5}$ C. $\frac{x^2+2x+1}{x-3}$
   B. $\frac{x+1}{y+1}$ D. $\frac{x+2y+z}{6x-5y+z}$

8. Which of the following represents a ratio of two polynomials?

A. $(2x+1)-(x-4)$
C. $(x+1)(x-3)$
B. $(x-5)+(5x-8)$
D. $\frac{(4x-1)}{(2x-3)}$

9. Which of the following is a rational algebraic expression that illustrates binomial in numerator and trinomial in denominator?

A. $\frac{d+1}{t+1}$
C. $\frac{x^2+x+1}{2x^2-9}$
B. $\frac{x+1}{x^2+x+1}$
D. $\frac{3x^2-2x-9}{x^3+2x-3}$

10. Vanness can accomplish his school project in z hours. What part of his school project can be completed by Vanness after 2 hours?

A. $z+2$
C. $2z$
B. $z-2$
D. $\frac{z}{2}$

11. The following are rational algebraic expressions EXCEPT

A. $\frac{4}{y+2}$
C. $\frac{5+3x^{\frac{3}{2}}}{x+10}$
B. $\frac{3x+8}{2x^4-x^2}$
D. $\frac{4x-10}{1}$

12. What is the value of x that will make the expression $\frac{x^4-3x+5}{x^2-6x+9}$ undefined?

A. 1
C. 3
B. 2
D. 4

13. Which of the following represents the phrase "The ratio of thrice the difference of twice x and thrice y to the difference of thrice x and y"?

A. $\frac{3(2x+3y)}{3(x-y)}$
C. $\frac{3(2x-3y)}{3x-y}$
B. $\frac{3(2x-y)}{3(x-y)}$
D. $\frac{3(2x)-3y}{3x-y}$

14. Marie takes x hours to plant 20 flower bulbs. Francine takes y hours to plant same number of flower bulbs. Which expressions below represents the rate of Marie and Francine working together?

A. $x+y$
C. $\frac{1}{y}+\frac{1}{x}$
B. $x-y$
D. $\frac{1}{x}-\frac{1}{y}$

15. The formula for finding the area of a rectangle is $A = lw$, where l is the length and w is the width of the rectangle. What is the formula in finding the length (l) of the rectangle given its area (A)?

A. $\frac{A}{l}$

B. $\frac{A}{w}$

C. $\frac{w}{A}$

D. $\frac{l}{A}$

Additional Activity

Abby and Ben were asked to find the real numbers for which the rational algebraic expression $\frac{x+1}{2\,(x-1)(3x+2)}$ is undefined. Their solutions are shown below together with their explanation.

Abby's Solution	**Ben's Solution**
$\frac{x+1}{(x-1)(3x+2)}$ $(x-1)(3x+2) = 0$ $x - 1 = 0 \quad \vert \quad 3x + 2 = 0$ $x - 1 + 1 = 0 + 1 \quad \vert \quad 3x + 2 - 2 = 0 - 2$ $x = 1 \quad \vert \quad x = -\frac{2}{3}$ 1 and $-\frac{2}{3}$ are the excluded values of the given rational expression, as these values will make the expression undefined.	$\frac{x+1}{(x-1)(3x+2)}$ $x + 1 = 0$ $x + 1 - 1 = 0 - 1$ $x = -1$ Hence, x cannot be equal to -1 since it will make the rational expression undefined.

Who do you think presented a correct answer and solution? Write your answer on a separate sheet of paper.

Answer Key

What I Know

1. C
2. A
3. A
4. C
5. B
6. A
7. D
8. C
9. D
10. B
11. A
12. B
13. A
14. D
15. B

What's In

A.

1. C
2. F
3. D
4. B
5. A

B.

1. P
2. NP
3. P
4. P
5. NP
6. NP

What's New

1. $\frac{6}{x-3}$
2. $\frac{y^2-1}{y^3-3}$
3. $\frac{18n+1}{n^2+n-2}$
4. $\frac{3x-\sqrt{y}}{5\sqrt{x}}$
5. $\frac{2x^{-2}-3}{x+6}$
6. $\frac{3-z^3}{z^{-2}+5}$

Questions:

1. fractions; yes
2. polynomials; yes
3. not polynomials; no
4. radical expressions and negative exponents; negative

What's More

Activity 1

Rational Algebraic Expressions:

$$\frac{1-y}{y^7}, \frac{\sqrt{7}x}{x-7}, \frac{2x^2+5}{x^2-7x+3}$$

Not Rational Algebraic Expressions:

$$\frac{b^4}{\sqrt[7]{c^5}}, \frac{x-y^{2/3}}{7y-7}, \frac{2x+1}{3x^{-2}-7x+1}$$

Activity 2

1. $x = 2$
2. $x = 1 \ or \ x = -1$
3. $x = 2 \ or \ x = 3$

Activity 3

1. $\frac{20}{3}$
2. -1
3. $-\frac{23}{10}$

Activity 4

1. $\frac{3+\frac{1}{3}n}{3n+7}$
2. $\frac{t}{4}$
3. Patricia: $\frac{1}{x}$; Joseph: $\frac{1}{y}$

What I Have Learned

(*in order*) $\frac{P}{Q}$; polynomials; zero; fraction; numerator; negative; fractional exponent; denominator; undefined; excluded; equal; solve; substituted; division; evaluating; simplify

What I Can Do

1. $\frac{2b+1}{b-1}$
2. 5; 3

Assessment

1. C
2. B
3. B
4. C
5. A
6. B
7. D
8. D
9. B
10. D
11. C
12. C
13. C
14. C
15. B

Additional Activity

Abby.

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